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ABSTRACT

Designed to serve as written guidelines for the production of videotex materials, this case study of a San Diego State University videotex production on personal finance provides a producer's perspective on the problems, opportunities, and challenges associated with the creation of videotex materials. A review of creative design decisions is included which describes the options available as well as the constraints imposed by system software, financial resources, and production timelines. The following production issues occupy much of the report: (1) the necessity for understanding the computer and delivery system; (2) an assessment of the target audience; (3) the approach to topic information gathering (in this case, the popular magazine model); (4) determining the unit size; (5) the selection of specific topics to include in each module; (6) flowchart development; (7) writing for the screen; (8) graphics design; and (9) software limitations. Also included are sample visuals that illustrate key points stressed in the paper. These include pre-production flowcharts, examples of screen writing, and presentation of graphic themes. (JB)

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Electronic Text Consortium

Electronic Text for Higher Education

San Diego State University, University of Wisconsin, University of Nebraska, WGBH Boston

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VIDEOTEX PRODUCTION:
A CASE STUDY

(Report Number Two)
of the
(Electronic Text Report Series)

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VIDEOTEX PRODUCTION:
A CASE STUDY

[Report Number Two]
of the
[Electronic Text Report Series]

Prepared by

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The Center for Communications
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for the

Electronic Text Consortium

An Annenberg/CPB Project

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Introduction

Until recently, the only way to learn how to produce videotex materials was through trial and error experience in a work setting. With only a few commercial services and even fewer educational applications, there has been little opportunity to develop written guidelines for those who wish to acquire production skills. This paper, the second in a series of reports published by The Electronic Text Consortium, attempts to fill some of the knowledge gap by providing a case study of one videotex product. It represents a producer's perspective on the problems, opportunities, and challenges associated with the creation of videotex materials. Creative design decisions are reviewed along with the constraints imposed by system software, financial resources, and production timelines.

Background to the Project

The Center for Communications and KPBS-TV at San Diego State University have been active in the design and development of videotex since 1982. Our initial project, funded by the Corporation for Public Broadcasting, involved a one-way videotex workbook that accompanied a broadcast telecourse, "Understanding Your Investments." The videotex materials were carried on Cox Cable's NDAX system in San Diego.

Following this project and a series of other production efforts for corporate videotex groups, the Center for Communications linked forces with KUON-TV at the University of Nebraska and received additional funding from the Corporation for Public Broadcasting to further explore interactive cable technology and videotex. As its part in the project, the Center was responsible for the development and evaluation of three separate interactive videotex programs on finance, health, and elementary education. This paper will document the experience of producing one of these programs--a series on personal finance.

Delivery System

A first crucial layer in the videotex production process is understanding the features of the computer and delivery system. In our case, the videotex products were created for Cox Cable's interactive videotex service--INDAX. During our test period, INDAX reached some 400 households in a defined San Diego test bed. The homes were connected to a central computer via two-way cable television. INDAX's newly developed software, Genie, allowed the viewers to "interact" with the material and not merely call up screens. Although this programming had some limitations (to be covered later), Genie represented one of the most sophisticated branching and instructional record keeping capabilities for videotex developed at that time.

The Target Audience

In producing videotex materials, it is important to have some "fix" on the target audience. In the San Diego trial, census tract information from the area defined by INDAX's test bed provided us with some general information. For the most part, the audience was married, middle-aged, with children in junior or senior high school. They were also home owners, living in a single family dwelling worth about $100,000 and earning approximately $35,000 a year. Thus, our target audience was upscale and living in a relatively stable community.

These data about our target audience were factored into both the videotex presentation of information and the actual selection of the topics on personal finance. Topics such as retirement planning, family budget, and tax planning would probably be of value to the audience, given their home ownership status, age, and income range.

Gathering Information on the Topic: The Popular Magazine Model

The topic of personal finance could have been approached from a number of different perspectives: academic scholarship, highbrow magazine journalism, broadcast news journalism, or popular magazine writing, among others. Our approach was based on some straightforward observations. In the magazine reading room in the basement of Love Library at San Diego State University, the current issues of over 3,000 magazines or journals are kept on open shelving for student browsing. A quick survey of these shelves indicated that only a few of the

magazines were well used. While most magazines remained neatly in their stacks, issues of Ladies Home Journal, Cosmopolitan, and Glamour were so well examined that most of their covers had been torn to shreds. Why? Perhaps students seeking a respite from academic endeavors would turn to the offerings within these magazines. Or, perhaps, the topics covered in these magazines--Sex, Beauty, Fashion and Fitness--provided the hook. Further, might such a "popular magazine" approach work in videotex--print information to be carried on two-way cable television to an upscale audience?

A closer investigation into the presentation of the material lead to some additional observations about popular magazine style and format.

- The focus was generally placed on the reader. A large portion of the titles and articles were written in the second person, YOU. (From Glamour, "Are You Ready for Marriage?")
- Several self quizzes were incorporated so that users could learn more about themselves. All the quizzes observed in the magazine reading room had been filled in, further indicating their popularity. (From Cosmopolitan, "How Well Do You Really Know Him?--A Quiz That Could Lead to More Questions.")
- The "how-to" or guide format seemed to be employed over and over. (From Ladies Home Journal, "How to Stop Feeling Lonely.")
- Much of the material was presented in list form with labels such as "tips" or "hot ideas." A lot of information seemed to be presented in bite-size pieces. (From Glamour, "10 Quick Tricks to Get Gorgeous.")

Although taken from sources the academic community generally ignores, these four approaches appeared to be worth testing in videotex technology. In fact, many of the techniques seemed to

be directly and easily transferable to the writing and designing of videotex programs for the following reasons:

- Writing in the second person (YOU) is appropriate in addressing a person viewing a television screen.
- Presenting self-quizzes is appropriate for the interactive structure of videotex on two-way cable.
- Practical guide writing or a series of "How-to's" gives the videotex programs a clear direction with an economy of words.
- Presenting simple lists or tips classify information into distinct pieces, a direct advantage in writing for a series of screens.

By employing these four guidelines in developing videotex programming, the topic at hand--personal finances--would be more informational than instructional in nature. Built on an entertainment base, the informational approach is more closely akin to traditional mass appeal content. While an instructional approach--built on goals, objectives and specific tasks to be completed--has a place in videotex design, it is not the approach we chose for this project.

Using the informational approach, it was our hope that viewers in their homes would feel comfortable browsing through the videotex units much like they browse through a newspaper or magazine. Presentation of the videotex material in an informational mode also lends itself to wide viewer options. The decision of what to view and what not to view, when to view it, or even how much to take from the program is all left up to the individual user. These options, along with the comfort of browsing through the information in their own home, could lead to positive user gratification in the new medium--an essential element in the eventual acceptance of videotex.

Producing the Personal Finance Videotex Package

From a producer's perspective, it is useful to think of interactive programs as having "personalities" which leave the viewer with impressions. The personality is based on the approach (informational vs. instructional), how the topics are covered (guide, how-to, etc.), what the program says to the viewer (content), how the program says it (writing style) and in what way the program responds to the viewer's input (flowchart). The following discussion examines some general "problems" or issues encountered and their resolutions. These should be viewed as preliminary resolutions or a working model of design principles. The emerging videotex field is too young for anyone to claim that their hard and fixed rules must be followed.

ISSUE: The Approach--What would be the general treatment of the subject?

Accepting the guidelines established in the planning phase, topics on personal finance would be presented as a practical electronic guide. Viewers could teach themselves some basic money management methods using their own financial situation. Drawing on the observations made in the magazine reading room, the writing would be in second person. Also, self quizzes and "lists of ideas" would be included as supporting material whenever appropriate. The overall style would be to take a straightforward, compact approach to important financial decisions viewers might be facing.

ISSUE: The Size--How big should the unit be?

The solution would be found not in the number of screens presented, but in the amount of time it would take a viewer to go through a package. The subject of personal finances would be divided into ten separate and independent units. Each of these units, focusing on one topic, could be viewed comfortably in a five to ten minute sitting, leaving the viewer with one major concept. By presenting major concepts in easily manageable time frames, the viewer could complete at least one unit in one sitting and then decide whether to view another or not. This decision was also made to encourage videotex's potential "browsing feature." It was important for the viewer not to feel committed to a large time period in order to gain anything from the programs. We would create "bite size" programming, leaving the decisions with the viewer to consume more or not.

ISSUE: Determining Specific Topics--What to cover?

There was no easy solution in selecting the ten "bite size" personal finance topics. Not only was the array of topics on the subject enormous, but also the level of presentation vast, ranging from the beginner levels to the expert. Imposed on this broad field was the practicality of coming up with topics quickly. A tight production schedule allowed only a couple of weeks per topic to develop the final flowchart and accompanying script.

For this reason, we selected topics that could be easily presented in one self-contained personal finance videotex unit and viewed in a five to ten minute user session. Further, topics were selected in relation to the anticipated needs of the target audience, as discussed earlier.

Our production time frame placed constraints on the overall design of the ten-unit package. Because of tight scheduling, most topics were individually selected on a bi-weekly basis in order to meet the deadline and to get the product out. A more cohesive package on personal finance may have resulted if more thought could have been given initially to the inter-connection and integration of topics within the package.

The following list describes the ten topics finally selected for the personal finance package.

1. FAMILY BUDGET (53 screens)[1] tallied a viewer's monthly budget items in areas such as Housing, Food, Transportation, Health Care, etc. and compared these figures to the "average San Diego family." Budget ratings were given along with optional money saving "hints."

2. LIFE INSURANCE GUIDE (65 screens) calculated a viewer's insurance needs (based on factors such as dependents, social security coverage, current assets/liabilities, etc.). A supplemental self quiz tested the viewer's basic understanding of simple life insurance principles.

3. ARE YOU IN DEBT? (51 screens) took the viewer's monthly figures on a number of possible debt items--car loans, credit cards, home improvement loans, personal loans, etc.--and gave an individualized debt rating. Also provided was a quiz which assessed the viewer's money management attitudes.

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[1]One "screen" represents the amount of information that can be presented on a TV screen. This varies somewhat among videotex systems. INDAX can display up to 15 lines of information per screen, each limited to 32 characters across. In practical terms, a screen can convey 50-75 words.

4. READY FOR RETIREMENT (40 screens) took a viewer's input on factors such as current age, likely retirement age, projected annual retirement needs, assets, and anticipated benefits (social security, pensions, etc.) and then assessed what the viewer needed to set aside each year prior to retirement in order to obtain his or her own retirement goals.

5. RETIREMENT PLANNING (41 screens) illustrate the value of IRA/Keoghs in setting up a retirement plan. Two $2000 pre-tax amounts were compared, one going to an IRA/Keogh and one going to a savings account, both yielding 10%. Based on the viewer's own tax bracket, the power of IRA/Keoghs tax deduction and tax deferments were graphically shown.

6. THE 1040 LINE-BY-LINE (77 screens) presented a simple, easy-to-read guide outlining the sections found on the 1983 form (Filing Status, Exemptions, Income, etc.).

7. PROJECTIONS AND POINTERS (56 screens) provided an electronic worksheet that helped viewers estimate their own 1983 federal tax bill (PROJECTIONS). Viewers were also given their tax brackets and shown if they should itemize or take the standard deduction. Fourteen tax tips (POINTERS) were also offered.

8. YOU, THE INVESTOR (85 screens) prompted viewers to think about their own investment goals--Safety, Yield, Liquidity, Appreciation and Tax Savings. Also presented were four investment categories--Stocks, Bonds, Mutual Funds and Real Estate Limited Partnerships--and how each stacked up in terms of individual viewer investment goals.

9. INVESTMENT DECISIONS (57 screens) took the game approach and asked viewers to play the role of an investment counselor offering their financial advice to ten different clients. Based on these investment selections, viewers were given a final score on their job as a financial counselor.

10. YOUR PERSONAL BUDGET (65 screens) took a new approach in examining the budgeting process by focusing on how the viewers spend on the "nonessentials"--things that make life a pleasure. A series of questions rated each viewer's own value system so viewers could then determine if they were spending their discretionary funds on what they really "value" in life.

This list illustrates the range and approach taken with the ten topics that were selected for this videotex unit.

ISSUE: Flowchart[2] Development--How to represent the topic interactively?

Flowchart development requires a great deal of work. We found that developing a topic or idea into a working flowchart involved three distinct steps. Step 1 involved the development of a plan of action. Step 2 translated that plan into a "concept outline" or rough cut of the flowchart. Step 3 changed this rough cut into the final working flowchart. Each of these three steps are examined in greater detail below.

Step 1. Once a topic had been selected for a particular unit, the topic had to be first translated into a rough plan of action suitable to the structure of INDAX. It was helpful to reorganize the information associated with a particular topic into a simple arithmetic problem or quiz. The "quiz" or "arithmetic" approach took advantage of viewer input and other two-way interactive features of the software.

The unit, READY FOR RETIREMENT, illustrates this point. The focus of the unit was to help viewers plan for their own retirement. Our plan was to present the topic around a simple arithmetic problem for the viewer. Two initial assumptions were made. The problem assumed that 1) the viewers would have 20 years of retirement living and 2) inflation and interest rates

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[2]A videotex unit consists of many screens of information. In turn, the screens must be linked together in some way. They could follow one after another, much like pages in a book. However, in most applications, the linkage is more complex. In creating these linkages, a videotex designer uses a flowchart to represent how viewers can move from one screen to another. (An illustration of a flowchart is presented on page 15.)

would balance each other out. The INDAX software could not accommodate more complex calculations.

With these assumptions in place, the software calculations involved a series of simple addition, subtraction, multiplication and division problems based on the viewer's input.

Current Age MINUS Projected Retirement Age = Years Left Prior to Retirement

Yearly Desired Retirement Income MINUS Yearly Retirement = Difference to be Made Up

Yearly Diff. to be made up TIMES 20 Retirement Years = Lump Sum Needed

Lump Sum Needed MINUS Current Assets = Adjusted Lump Sum Needed

Adjusted Lump Sum Needed DIVIDED BY Years Left Prior to Retirement = THE BOTTOM LINE: Amount needed to be set aside each year prior to retirement to cover a 20 year retirement period deficit.

The approach to the topic of this unit was becoming clearer. The producer now knew what input was needed from the viewers, what information associated with that input would be necessary to present and what feedback the viewer would be given.

Step 2. The second step changed that plan into a concept outline, or the first rough cut of the final flowchart. It is important to note that coming up with an arithmetic problem or a quiz transforming a specific topic into a plan is only half the battle. These units were also intended to teach some basic concepts and not merely manipulate viewer data. So, although the math problem in this example on retirement did help to define and lay the framework for the program, it did not account for the ordering of the concepts or for the supporting material that

would accompany viewer input and program calculations. That support information would have to be drawn from other sources and then placed logically within the framework of the program. Integrating the information components within the plan by developing a concept outline makes up the second step.

The purpose of the concept outline is to define and focus on the general placement of concepts without getting bogged down in the final details. This step was accomplished by first listing the major concepts defined by the plan onto index cards. These cards could then be shuffled around until the order seemed logical. The cards were then either taped on a large sheet in the established order or a rough sketch was made. This intermediate, but important step was necessary to establish the basic flow so that the final detailed working flowchart could be developed.

Using READY FOR RETIREMENT as an example of step 2, the concept outline, depicted on the next page, was used to place major concept areas, viewer input and necessary calculations into logical order.

Step 3. The final step in this process involves working out all the details. Starting with the concept outline, each general area is researched, analyzed and broken down into smaller units until the final flowchart emerges. This flowchart becomes the exact roadmap to the information stored in the database and also serves as the official working document of these two-way interactive videotex programs. The working document must clearly

Concept Outline from READY FOR RETIREMENT

1. Concept: Opening
   - Introduction
   - Instructions
   - Assumptions

2. Concept: Current Age
   - Input current age
   - Feedback—overview of retirement planning for various age groups (eliminate the 65+ group)

3. Concept: Retirement Age
   - Input desired retirement age
   - Information section on early vs. late retirement, pros and cons

4. Concept: Annual Retirement Needs
   - Input needed retirement income
   - Information section on retirement budgets—what to expect

5. Concept: Projected Yearly Retirement Benefits
   - Input social security, pensions, and misc. benefits
   - Information section on what to expect from each benefit

6. Concept: Current Assets
   - Input assets

CALCULATIONS NEEDED:

1. Years prior to retirement
2. Retirement income covering a 20 year period
3. Total retirement benefits
4. Difference between benefits and needed retirement income
5. If benefits less than needs, multiply difference by 20 year period
6. Subtract assets from lump sum difference from #5
7. Divide Lump sum (#6) difference by years left prior to retirement (#1)

FINAL VIEWER FEEDBACK:

- Summary of input and calculations
- If assets cover the difference, give feedback and chance to change some figures
- If assets do not cover the difference, give how much is needed to be set aside each year prior to retirement.

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communicate to other members involved in the production the various paths available to the user and all other details in the program.

To outline some of these details and to present a comparison of the concept outline, the flowchart from READY FOR RETIREMENT is presented on the next page. Note that each screen, represented by a box, and each calculation, represented by a parallelogram, is given specific numbers corresponding to nodes within the database. User input is stored in accumulators (A1, A2, etc.) and represented as A1=R (response). DA (display accumulator) is listed on the various screens which show the viewer computer calculations.

ISSUE: Writing--How to write for the screen?

To establish a uniform style, many of our writing guidelines were established even before topics were selected. As discussed earlier, the units would be an electronic guide written in the second person offering support material in the form of lists or quizzes.

Writing for videotex is a particularly important issue because the writing style sets the tone or personality of the program. In creating the videotex package, different team members--producer, content specialist, instructional designer, graduate students and the newly curious--were brought in to cross check various aspects of each other's work.[3] The varied inputs

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[3]Key team members for the personal finance series were:
Nancy Bamberger (Center) - producer/designer/writer
Jesse Sank (Center) - information specialist
Dr. Gwen Nugent (UNL) - technical support/computer programmer
P. J. Peters (UNL) - graphic artist

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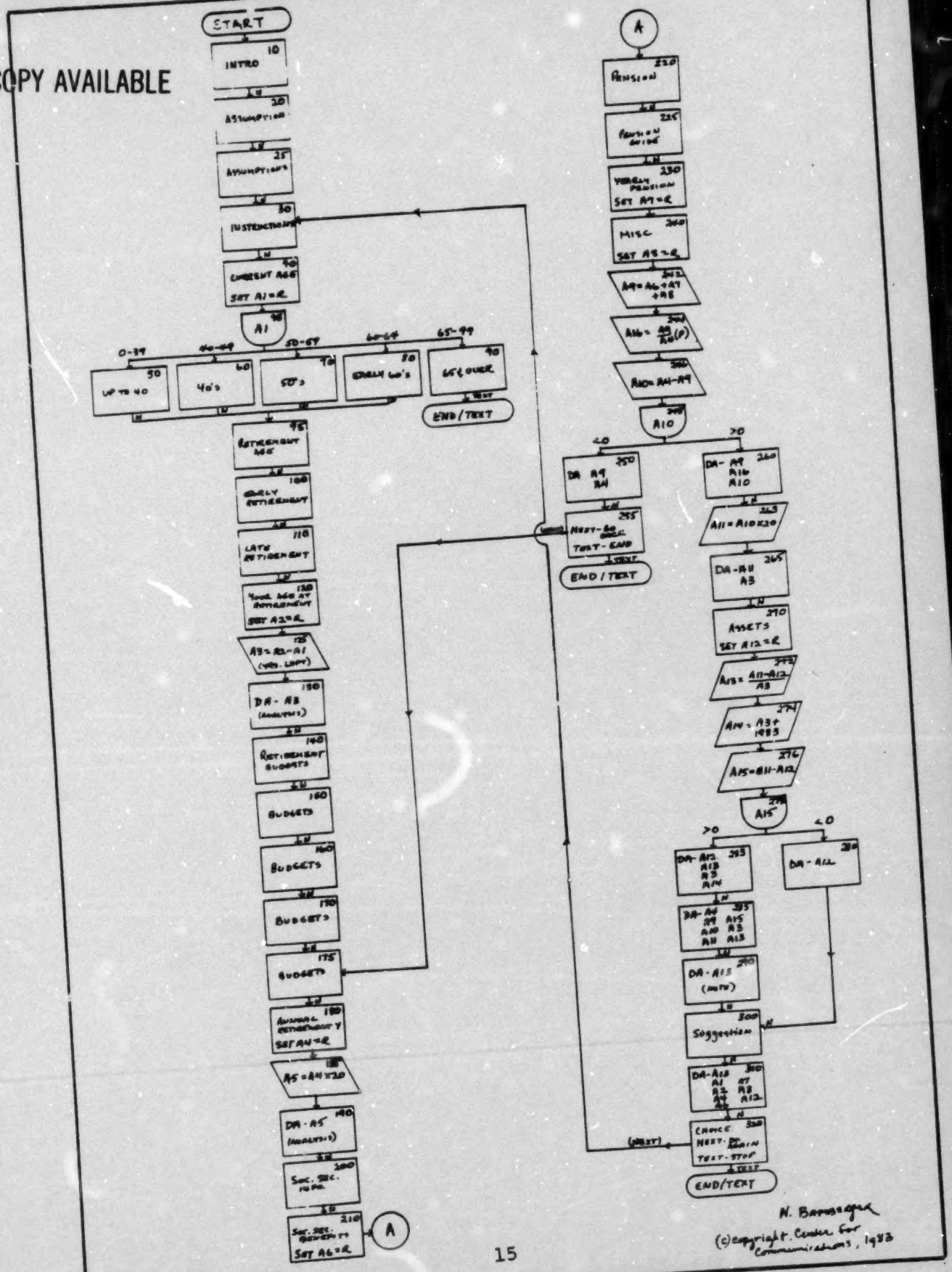

N. Barnegger

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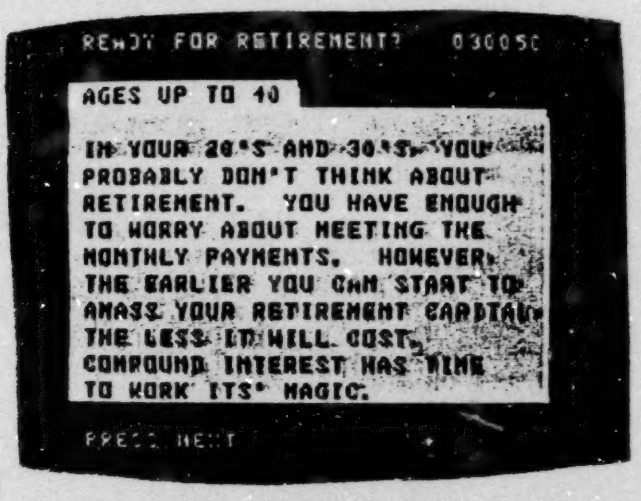
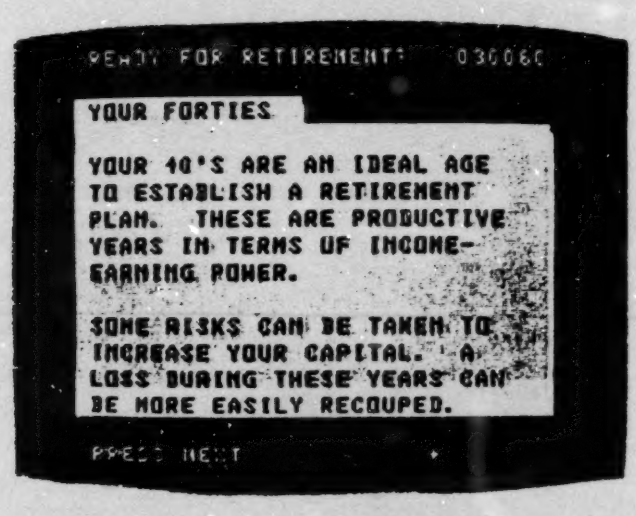
strenthened the product. However, the writing always remained the responsibility of one person. This was done to ensure a tight, coherent unit with a distinct personality communicating to the viewer. A sample of screens from the unit READY FOR RETIREMENT illustrates the type of writing used in addressing the viewer.

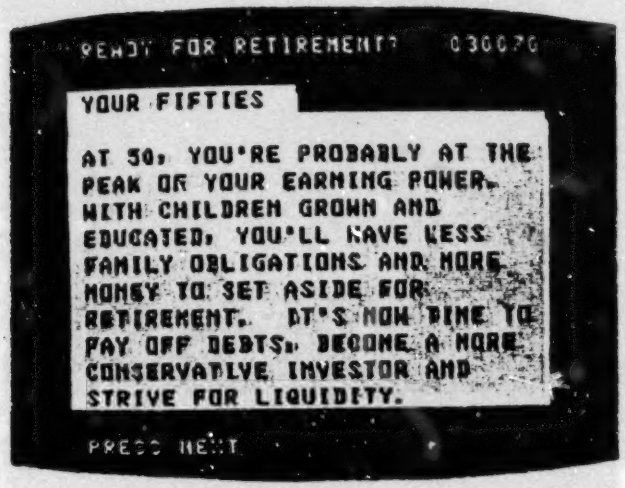
Viewers, ages up to 40, received this screen:


READY FOR RETIREMENT?
AGES UP TO 40
IN YOUR 20'S AND 30'S, YOU PROBABLY DON'T THINK ABOUT RETIREMENT. YOU HAVE ENOUGH TO WORRY ABOUT MEETING THE MONTHLY PAYMENTS. HOWEVER, THE EARLIER YOU CAN START TO AMASS YOUR RETIREMENT CAPITAL, THE LESS IT WILL COST. COMPOUND INTEREST HAS TIME TO WORK ITS' MAGIC.

Viewers, ages 40 to 49, received this screen:


YOUR FORTIES
YOUR 40'S ARE AN IDEAL AGE TO ESTABLISH A RETIREMENT PLAN. THESE ARE PRODUCTIVE YEARS IN TERMS OF INCOME-EARNING POWER.
SOME RISKS CAN BE TAKEN TO INCREASE YOUR CAPITAL. A LOSS DURING THESE YEARS CAN BE MORE EASILY RECOUPED.

Viewers, ages 50 to 59, received this screen:


YOUR FIFTIES
AT 50, YOU'RE PROBABLY AT THE PEAK OF YOUR EARNING POWER. WITH CHILDREN GROWN AND EDUCATED, YOU'LL HAVE LESS FAMILY OBLIGATIONS AND MORE MONEY TO SET ASIDE FOR RETIREMENT. IT'S NOW TIME TO PAY OFF DEBTS, BECOME A MORE CONSERVATIVE INVESTOR AND STRIVE FOR LIQUIDITY.
PRESS NEXT

These examples illustrate that the program sought to be personable without being overly friendly. The main goal was to provide a sense of good service while being economical in word count.

In writing for videotex, it is important to note that screen size limitations make editing a must. So many times a thought was whittled down to half its size in order to be placed on a single screen. In nearly every instance, the "forced editing" process was beneficial, making the thought clearer.

Writing for a "screen" also raises the issue of "screen fill" quotients. Many videotex designers recommend that screens should be about 50 to 60 percent full, leaving the rest for system messages and open space. This is a useful guideline. However, the problem is more complex. Videotex "encourages" or seems best suited for "screen oriented" messages. Within this design guideline, each frame communicates one message. It is

likely that designing and writing "screen oriented" messages may be more difficult than adhering to "screen fill" quotients. Yet, one carefully edited thought or message per screen appropriately addresses the manner in which viewers access videotex information. Each time the user presses the key for "NEXT," that action triggers a message unit. By focusing on "screen oriented" messages, it is possible that a major drawback of the system, limited screen size, could actually become an advantage, allowing viewers to digest one thought after another at their own pace.

Writing also served as transitions between major concept areas, tying all the pieces of the program into a cohesive body. Many times, the transitions required only a line or two at the bottom of the screen. Something like --

UP NEXT: SUMMARY OF YOUR RETIRMENT NEEDS

can serve to smooth out the rough edges and eliminate any jarring inter-screen transition on the part of the viewer. In addition, transitions were needed along the various paths. Although the software provides many options in the design of the total program, the user follows only one path. Thus the actual viewing of the program is linear. Since the writer/designer does not know which particular path any given user will take, all paths must be smoothed out using transitions. If a viewer was given a choice to skip a section or go back and review a section, simple written transitions (a line or two) or even an additional screen were inserted to keep all pathways coherent.

The importance of the writing cannot be overstated in the development of any videotex program. If done skillfully, the

writing establishes the personality of the package, sets the tone, makes a coherent whole out of many separate pieces on the flowchart, and presents the information with clarity.

ISSUE: Graphics--How to make the program pleasing to the eye?

Given the limitations of INDAX's present low resolution alphamosaic graphics, it was decided not to use any "pictures." The elimination of any "pictures" was based partially on earlier research conducted by the Center for Communications under a contract with a corporate client. The research found that viewers preferred "text only" screens to screens with strictly decorative graphics which did not contribute meaning. In fact, viewers found the use of these "strictly decorative pictures" unnecessary and even irritating at times.

Graphics for the personal finance unit were used to establish a clean, simple look, and to tie the ten separate programs into one overall concept. The graphics consisted of an index card, or notecard template, highlighted by drop shadows. Except for the two special programs on taxes, information on each screen in the personal finance unit was formatted into this simple notecard with the title of the screen placed on the tab of each notecard.

The design of the notecard served three important purposes:

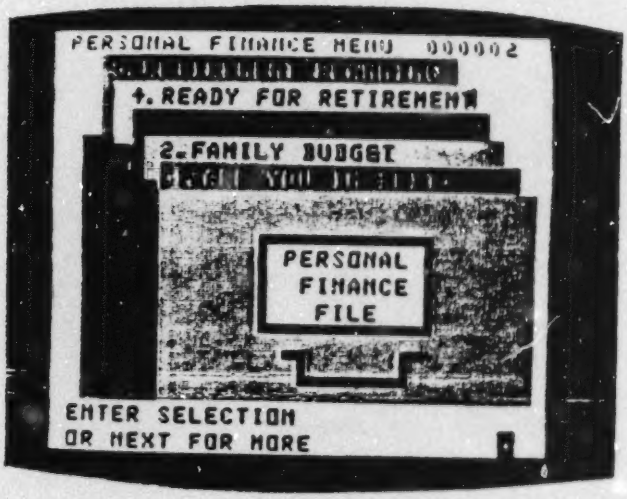
1. The simple design provided a clean border, leaving breathing space around the edges, avoiding any appearance of over-crowded screens.

2. The "meat" or information in each program could always be found within the confines of the notecard, leaving the "extras"--system messages, routing, program title and frame numbers--on the outside.

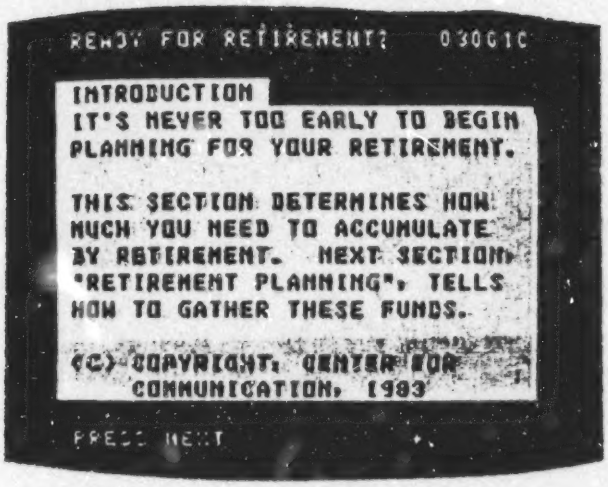
3. The simple graphic design of the notecards helped to tie the ten programs together into a cohesive unit entitled THE PERSONAL FINANCE FILE.

To illustrate how the viewers found their way through the database and how the graphics established this PERSONAL FINANCE FILE theme, the following screens are presented along with some commentary on the design.

From the INDAX main menu, a user would select "Personal Finance" and then receive the screen entitled "Personal Finances Menu" depicted below.



This screen served both as a selection point and as a confirming title page, assuring the viewers that they had been delivered to the correct section within the database. If #4 were selected, viewers would then receive the screen, illustrated on the following page, which would begin the package entitled READY FOR RETIREMENT.


READY FOR RETIREMENT? 030C1C
INTRODUCTION
IT'S NEVER TOO EARLY TO BEGIN PLANNING FOR YOUR RETIREMENT.
THIS SECTION DETERMINES HOW MUCH YOU NEED TO ACCUMULATE BY RETIREMENT. NEXT SECTION, "RETIREMENT PLANNING", TELLS HOW TO GATHER THESE FUNDS.
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Eight of the ten programs within the PERSONAL FINANCE FILE carried the notecard theme, each with a separate color for the notecard and background. The two remaining programs were special edition sections on federal tax and were designed to simulate the 1040 tax form.

Our solution to the graphics problem seemed a logical fit, creating a clean, friendly look. This also solved another problem--the tight production schedule. The screens were written in San Diego and rendered as videotex screens in Nebraska by the graphic artist. By establishing the notecard design, clear parameters were set for the entire unit on personal finance. This facilitated easy communication between all members of the production team.

ISSUE: Software Limitations--How to get around them?

Genie, INDAX's second generation interactive software, had many sophisticated features, but it did impose some limitations.

In order to understand what Genie could not do, it is necessary to first dicuss what it could do. Basically, Genie allowed branching from any screen in the videotex unit to any other screen. Genie could also record up to 100 student responses (called accumulators) per program. Simple computations (addition, subtraction, multiplication and division) could be performed on the values stored in the accumulators. The results of these accumlators could be displayed on the screen in their numerical form or translated into some textual form. These characteristics provided many design options. However, there were limitations as well which required some creative solutions.

Genie did not accomodate decimals. Because of this, the viewer could only enter whole numbers. Also, the computer calculations could not truncate or deal with floating point arithmetic. This particular limitation greatly hindered working with two important elements in the subject of personal finance--interest rates and inflation rates. We were able to find a way around these limitations. In the program, READY FOR RETIREMENT, interest rates and inflation rates were assumed to be equal when assessing what the viewer needed for retirement. This is a reasonable working assumption since many feel that the two cancel each other out over time. In fact, the viewer is told that, based on this conservative assumption, he or she will probably come out ahead in his financial assessments because most experts contend that interest earned on investments and savings will be higher than inflation.

In the program, RETIREMENT PLANNING, it was important to actually compute interest accumulated in an IRA/Keogh account contrasted with a savings account. In order to determine the yield on a $2,000 IRA/Keogh over a 20 year period, given the viewer's tax bracket, a series of 60 separate calculations had to be made. Only one calculation using floating point arithmetic would have been necessary to carry out this same function.

Another limitation was the absence of a random number generator--an important element in designing drills and games (e.g. a random number generator can serve the same function as throwing dice in a board game). This constraint was overcome in the development of the INVESTMENTS GAME (a unit separate from personal finance). In order to start the game, the user was asked to enter a number between 0 and 25. This seed number defined a path establishing both the order and selection of three separate and random (rather, pseudo-random) economic events--Boom, Bust and Uncertainty. The mixing of these events served as the crux of the game.

Conclusion

When any new technology is introduced, there is a tendency to use it in the same manner as the technologies that precede it. This stems not from the technology itself, but from the perceptions of what the technology can and cannot do. In short, the limitations that are imposed upon any new technology stem from the beliefs which are held about it and the existing habits in the production of content. It appears that we must go through

a process of trial and error, creative breakthroughs and slower evolution in usage. In this sense, videotex technology is at a very early stage of creative development.

This paper has described how our project team at the Center for Communications approached the design of one videotex unit. It is our hope that the analysis and discussion herein will inform other producers of videotex materials. In addition to this production perspective, the Center has conducted a user evaluation of the videotex materials in Personal Finance. The results of the evaluation will be reported in a subsequent paper of the Electronic Text Consortium.